1.6: PERIPHERAL AND CENTRAL AMBULATORY BLOOD PRESSURE IN RELATION TO ECG VOLTAGE

Wen-Yi Yang, Blerim Mujaj, Ljupcho Efremov, Zhen-Yu Zhang, Lutgarde Thijs, Fang-Fei Wei, Qi-Fang Huang, Aernout Luttun, Peter Verhamme, Tim Nawrot, Jose Boggia, Jan Staessen

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Average cPP was 36 ± 7 mmHg, PPamp 1.57 ± 0.13. CPP was positively associated with male sex, BSA, MAP, SI, and negatively with HR (47% of CPP variance explained). PP was positively associated with male sex, BSA and SI (44% of CPP variance explained). PPamp was positively associated with age, HR and cf-PWV (17% of PP variance explained). Results did not change when BMI and height replaced BSA, ILVM replaced SI, and cr-PWV or PWV ratio (cf-PWV/cr-PWV) replaced cf-PWV.

Anthropometric and hemodynamic factors differently impact on cPP, PP, and PPamp. HR and MAP are related to cPP, but not to PP, HR, cf-PWV and age are all positively related to PPamp. These results could help in better elucidate the clinical relevance of some BP patterns frequently observed in adolescence.

### Table

<table>
<thead>
<tr>
<th></th>
<th>cPP</th>
<th>pPP</th>
<th>PPamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>0.33</td>
<td>0.40</td>
<td>—</td>
</tr>
<tr>
<td>BSA, m²</td>
<td>0.28</td>
<td>0.32</td>
<td>—</td>
</tr>
<tr>
<td>Heart rate, bpm</td>
<td>0.21</td>
<td>-</td>
<td>0.32</td>
</tr>
<tr>
<td>Mean arterial pressure, mmHg</td>
<td>0.11</td>
<td>-</td>
<td>—</td>
</tr>
<tr>
<td>Stroke index, ml/m²</td>
<td>0.09</td>
<td>0.09</td>
<td>—</td>
</tr>
<tr>
<td>Carotid-femoral PWV, m/s</td>
<td>—</td>
<td>—</td>
<td>0.11</td>
</tr>
<tr>
<td>Age, years</td>
<td>—</td>
<td>—</td>
<td>0.10</td>
</tr>
</tbody>
</table>

### 1.4

**A PROTEOMIC MARKER OF DIABETIC NEPHROPATHY IS ASSOCIATED WITH MORTALITY IN PATIENTS WITH TYPE 2 DIABETES**

Gemma Currie 1, Sheon Mary 1, Bernt Johan von Scholten 1, Morten Kofod Lindhardt 1, Harald Milschak 1, William Mullen 1, Peter Rossing 1, Christian Delles 1

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2Steno Diabetes Center Copenhagen, Denmark
3Mosaikes, Diagnostics GmbH, Germany

**Background:** The urinary proteomic classifier CKD273 has been found to predict diabetic nephropathy development in advance of microalbuminuria. Whether it is also a determinant of mortality and cardiovascular disease in patients with established albuminuria is unknown.

**Methods:** We studied 155 subjects with T2D, albuminuria (geometrical mean [IQR]: 85 [34;194] mg/24 hrs), controlled blood pressure (129/86 mmHg), and linked to ECG voltages. Anthropometric and hemodynamic factors differently impact on cPP, PP, and PPamp. HR and MAP are related to cPP, but not to PP, HR, cf-PWV and age are all positively related to PPamp. These results could help in better elucidate the clinical relevance of some BP patterns frequently observed in adolescence.

### 1.5

**DESPHOSPHO-UNCARBOXYLATED MATRIX GLA PROTEIN IS A NOVEL CIRCULATING BIOMARKER PREDICTING DETERIORATION OF RENAL FUNCTION IN THE GENERAL POPULATION**

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4R&D Group Vitak, Maastricht University, Netherlands

**Background:** Recent studies showing an inverse association between estimated glomerular filtration rate (eGFR), a microvascular trait, and inactive desphospho-uncarboxylated matrix Glu protein (dp-ucMGP) support the hypothesis that after vitamin K dependent activation MGP is renoprotective, but were limited by their cross-sectional design.

**Methods:** In 1009 randomly recruited Flemish (50.6% women), we assessed the association between eGFR and plasma dp-ucMGP, using multivariable-adjusted analyses.

**Results:** From baseline to follow-up 8.9 years later (median), dp-ucMGP increased by 3.7%, whereas eGFR decreased by 4.05 ml/min/1.73 m² (P < 0.001). In 938 participants with baseline eGFR > 60 ml/min/1.73 m², incidence of eGFR < 60 ml/min/1.73 m² at follow-up was 8.0% vs. 4.1% in the top vs. the bottom halve of baseline dp-ucMGP. For each doubling of baseline dp-ucMGP, eGFR at follow-up decreased by 1.36 ml/min/1.73 m² [95% confidence interval (CI) 0.53–2.17 ml/min/1.73 m²; P = 0.001]. The hazard ratio expressing the risk of progression to eGFR < 60 ml/min/1.73 m² was 1.67 (95% CI 1.16–2.41; P = 0.006). The hazard ratio relating the presence of microalbuminuria at follow-up to baseline dp-ucMGP was 1.96 (95% CI 1.22–3.12; P = 0.005).

**Conclusions:** In conclusion, circulating inactive dp-ucMGP, a biomarker of poor vitamin K status, predicts renal dysfunction. Possible underlying mechanisms include protection by activated MGP against calcification and inhibition of bone morphogenetic protein signaling pathway.
in systolic/diastolic BPs and pulse pressure averaged 11.8/−1.6, 12.7/−1.8 and 10.3/−1.2 mmHg and 13.4, 14.4 and 11.5 mmHg, respectively (P < 0.0001). Cornelia and Index averaged 11.8 mV and 114.8 mV ms. The Cornel voltages were 0.104/0.086 and 0.082/0.105 mV higher in relation to brachial 24-h and aslee systolic/diastolic BP (per 1-SD), respectively, and 0.088/0.90 mV and 0.087/0.107 mV higher in relation to central BP. The corresponding estimates for the Cornel indexes were 9.6/8.6 and 8.2/105 mV ms peripherally and 8.6/8.9 and 8.8/10.7 mV ms centrally. The regression slopes were similar for brachial and central BP (P > 0.054). Associations of the ECG measurements with awake BP, PP, the augmentation ratio and pressure amplification did not reach significance.

### Results: NIAGEN® safely and effectively raised circulating levels of NAD+ and related metabolites. Although no effect was observed on endothelial function, NIAGEN® significantly lowered PWV as well as systolic (SBP) and diastolic blood pressure (DBP) in all subjects (P < 0.05). When separated by baseline BP status, the BP-lowering effect of NIAGEN® was observed in pre-hypertensive (pHTN, n = 13) but not normotensive (N = 11) individuals (P < 0.01). Interestingly, NIAGEN® was lowered in all subjects regardless of baseline BP status. Conclusion: Chronic NIAGEN® supplementation lowers SBP in pHTN older adults and reduces aortic stiffness, independent of baseline blood pressure status.

### Table

<table>
<thead>
<tr>
<th>Cornell voltage (SV3 + RaVL, mV)</th>
<th>Central BP</th>
<th>Systolic BP</th>
<th>Awake</th>
<th>Asleep</th>
<th>Peripheral BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate (95% CI)</td>
<td>Central BP</td>
<td>Estimate (95% CI)</td>
<td>24-h</td>
<td>Awake</td>
<td>Asleep</td>
</tr>
<tr>
<td>0.104 (0.016 to 0.191)</td>
<td>0.021</td>
<td>0.088 (0.003 to 0.177)</td>
<td>0.049</td>
<td>9.61 (0.65 to 18.57)</td>
<td>0.036</td>
</tr>
<tr>
<td>0.086 (−0.001 to 0.175)</td>
<td>0.054</td>
<td>0.062 (−0.026 to 0.151)</td>
<td>0.17</td>
<td>7.69 (−1.30 to 16.69)</td>
<td>0.093</td>
</tr>
<tr>
<td>0.082 (−0.006 to 0.170)</td>
<td>0.068</td>
<td>0.087 (−0.001 to 0.175)</td>
<td>0.053</td>
<td>8.17 (−0.82 to 17.16)</td>
<td>0.075</td>
</tr>
</tbody>
</table>

EKG refers to electrocardiography. BP stands for blood pressure. Cornell voltage is the voltage sum of the voltage in precordial V3 lead (SV3) and the voltage in limb lead RaVL, while Cornell index is the product of QRS duration multiplied by the Cornell voltage. The estimate (95% Confidence Interval, CI) of the association estimates of Cornell voltage (SV3 + RaVL) with awake BP, PP, the augmentation ratio and pressure amplification did not reach significance.

### Conclusions:

The diurnal rhythm of peripheral and central BP run in parallel. Central BP does not improve the association of Cornell voltage or index with peripheral BP.

### Joint Session with LATAM and North American Artery

#### NAA1

**NADPHRIC RIBOSIDE SUPPLEMENTATION REDUCES AORTIC STIFFNESS AND BLOOD PRESSURE IN MIDDLE-AGED AND OLDER ADULTS**

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2Department of Pharmaceutical Sciences, Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado Anschutz Medical Campus, Denver, CO, USA

**Aim:** To analyze the association of standardized arterial parameters with interindividual variations of body mass index (BMI) in pediatric populations. However, none integrate different arterial parameters as comparable continuous (standardized) variables, in order to assess their association with standardized (age- and sex-independent) BMI scores (zBMI).

### Purpose:

Regular calorie restriction (CR) improves endothelial function and lowers arterial stiffness in older mice and humans; however, adherence to sus-
tained CR remains poor, and possibly unsafe in normal weight older adults. Nicotinamide adenine dinucleotide (NAD+) is an important signaling molecule involved in the beneficial effects of CR and we have recently demonstrated that boosting NAD+ reverses these measures of arterial aging in older mice. The purpose of this study was to determine if supplementation with nicotinamide riboside (NIAGEN®; ChromaDex, Inc.), a naturally occurring precursor to NAD+, would similarly improve vascular function with aging in humans.

### Methods:

Healthy middle-aged and older adults (65 ± 2 yrs, n = 24) received oral NIAGEN® (500 mg, 2x/day) and placebo capsules for six weeks each in a randomized, placebo-controlled crossover study. Blood pressure (BP), aortic stiffness (carotid-femoral pulse wave velocity [PWV]), and endothelial function, (brachial artery flow-mediated dilation [FMD]), were measured at the end of each intervention phase.

### Results:

We found a positive and significant association between zBMI and standardized pSBP (β = 0.210), pPP (β = 0.150), cSBP (β = 0.204) and cPP (β = 0.188), CCA DD (β = 0.143), FCA (β = 0.135), and CCA EM (β = 0.117).